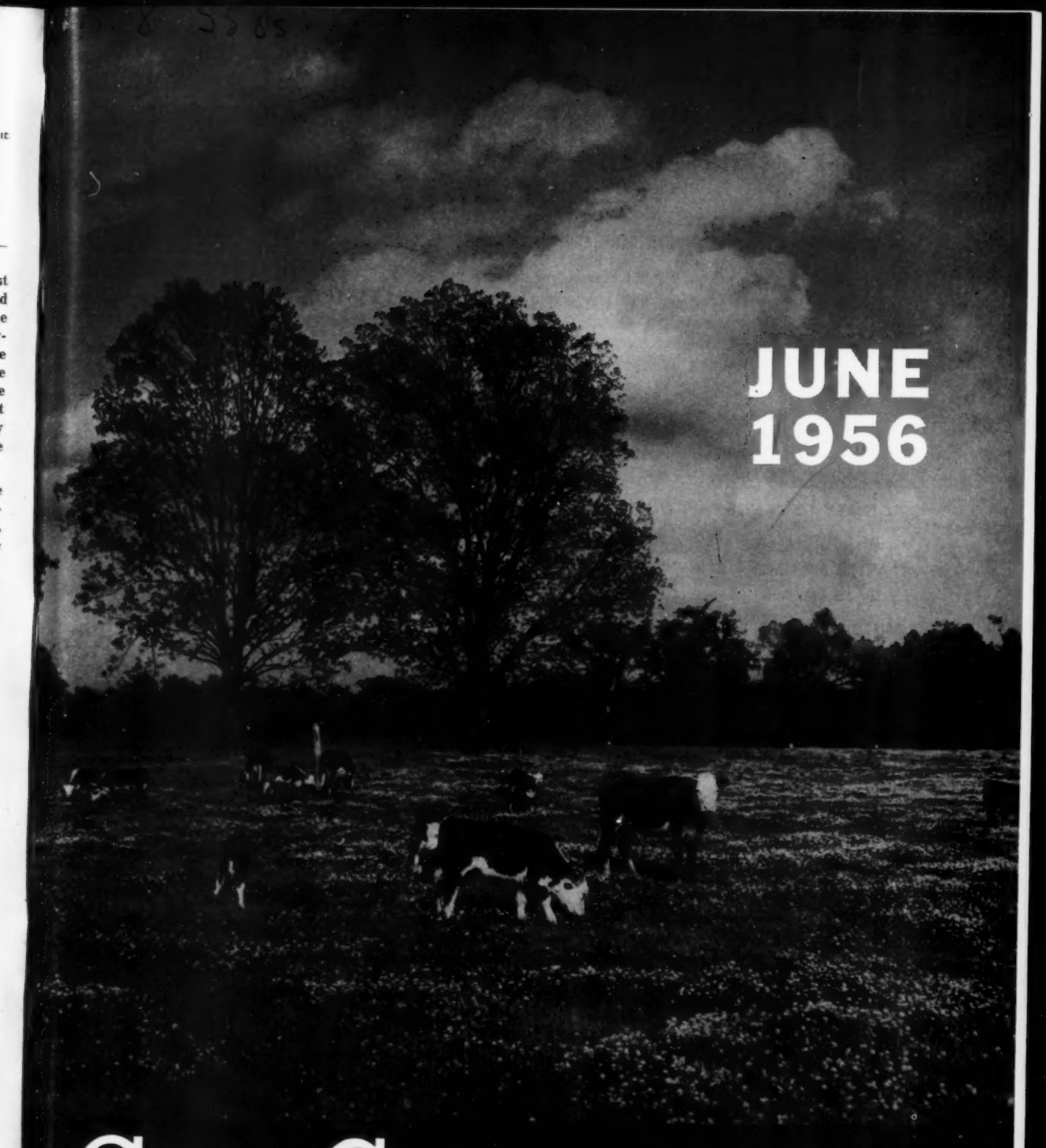

JUNE
1956

# SOIL CONSERVATION

Soil Conservation Service • U. S. Department of Agriculture

# SOIL CONSERVATION

JUNE 1956

VOL. XXI—NO. 11

EZRA TAFT BENSON
SECRETARY OF AGRICULTURE

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ADMINISTRATOR, SOIL CONSERVATION SERVICE

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**ANTI-POLLUTION CAMPAIGN.**—The pollution committee of West Virginia Sportsmen Unlimited, Inc., has launched a new campaign against stream pollution in that State which has some teeth to it. It is distributing a striking and easily understood poster, and the excellent booklet "Modern Sewage Treatment." More important, it has added a new and potentially effective device to get corrective action by the State where needed.

The committee is supplying dual printed postcards at cost to all 215 chartered outdoor clubs in the State. They are addressed to the State Water Commission on one half and addressed to Governor Marland on the other. The cards are for reporting details of stream pollution cases noted by members.

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**A PROFITABLE TREE CROP**—W. M. Glass of Prescott, Ark. planted 5 acres to pine seedlings in 1942. In 1953 he made his first thinning and sold more than $250 of wood products. He still has a healthy and growing woods.

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**Editors are invited to reprint material originating in this magazine.**

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**FRONT COVER**—Dallisgrass, bermudagrass, and white Dutch clover pasture in Louisiana.


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# *Fairfield County Stages A Comeback*

By HENRY F. CAUTHEN

FAIRFIELD County, S. C., is a land of almost revolutionary transformation, and the change—all of it for the better—is still in process—spreading over the hills and through the valleys.

It can all be defined by three words beginning with the letter "P"—Pines, Pastures, and Ponds. From this triumvirate has come a condition described by another word beginning with "P"—Prosperity.

A day spent driving over Fairfield can be a day of gratification for the South Carolinian interested in the development of his State—even for the man who is not a farmer.

Recently I spent the better part of a day driving over the county. My host was R. M. Blair, farmer and soil conservation district supervisor. Mr. Blair drove me over lands which show the transformation from the poverty of eroded lands to the prosperity of pines and pastures.

Here plantations were operated by his ancestors, and others, before the Revolutionary War. There are still some relics of that era and many of the period between the Revolution and the Confederate War. When the antebellum plantation system went out in Fairfield, and later when cotton declined, lands were deserted and tragic erosion set in. Indeed, the county became famous for its gullies and the disappearance of its topsoil.

Today, men such as Mr. Blair can look with satisfaction to a Fairfield that still shows many of the scars and other evidences of erosion, but that also has thousands of acres of rolling pastures, which feed beef and dairy cattle and grip the hillsides and defy erosion. And where pasture grass isn't protecting the sloping lands, terracing and other modern soil practices advocated by the men of the Soil Conservation Service is "catching" and holding the land.

In 1928, H. H. Bennett and W. R. Chapline wrote in a publication entitled "Soil Erosion A National Menace" that in Fairfield County, S. C., erosion had ruined 90,000 acres of land and rendered it suitable only for growing trees and grass. In 1934, the condition of the land was probably worse.

If Bennett and Chapline were to return to Fairfield County today they would hardly recognize the countryside. The change, says Henry F. Cauthen, managing editor of the *Columbia Record*, can be attributed to pines, pastures and ponds.

Recently Mr. Cauthen spent a day in Fairfield visiting the farms in the county and talking to farmers, bankers, businessmen, and others. The information he gathered formed the basis of a series of three stories which he wrote for his paper. Excerpts from the stories make up the profile of Fairfield County as it is today. The condensation of Mr. Cauthen's stories in this article is being run with Mr. Cauthen's permission.

Any day in Winnsboro a common sight is truck after truck loaded with pulpwood and heading for the big woodyards. Much other pulpwood moves directly from assembly points on the rail lines in other parts of the county.

From the sale of its pine Fairfield is deriving a revenue of more than a million dollars a year. The dollar mark is now on the pine tree. Men here have seen it pay off. They know it will continue to pay off, and they are cutting the trees scientifically. They are planting seedlings, too.

Leaders in Fairfield County give full and warranted credit to two groups for what has happened here in the last 20 years—the men of the Soil Conservation Service, with their know-how, and the men of the big paper companies which buy the pulpwood. The influence of the groups has spread to individual farmers as had the sound leadership of the SCS.

H. E. Johnson, cashier of the Merchants and Planters Bank of Winnsboro, joins many others

Pasture scene in Fairfield County.

in recognition of the good and widespread results of the guidance which the men of the SCS have brought to Fairfield.

There are 447,000 acres of land in Fairfield County. More than 300,000 acres are in woodlands. It is estimated that about 308,000 cords of pulpwood were cut and sold in the county last year, with the proceeds exceeding a million dollars.

Under the impact of this, land values have of course gone up. A minimum of $50 an acre is being paid for cutover woodlands. Good pasture land (if you can buy it) runs much higher. The Fairfield farmer, bolstered by the continuing demand for pine, the steady demand for milk and beef, and confident in his know-how in both fields, is a strong, substantial man today, not worried about the future—and the commerce and general economy of the entire county reflects his healthy condition.

You can stand on a high point on Dave Crawford's cattle farm in Fairchild and see from there almost 500 acres of pasture, broken only by ponds and undulations of the land.

Fairfield's economy is now one of beef cattle, dairying, and pulpwood. Thousands of acres of its once severely eroded lands have been reclaimed for cattle farms. On some graze Fairfield's dairy cattle, and on the others Herefords, and other breeds of beef cattle.

Almost every inch of Mr. Crawford's farm is covered with grass. At the bottom of some of the slopes are the clear-water ponds which provide water for his cattle. The water in the ponds is entirely surface water that flows down to them from the grassed slopes.

On the drizzling afternoon I visited the farm, Mr. Crawford was found seated in a truck watching wild ducks move in to light on his ponds. You could see some of the understandable pride of Mr. Crawford in these magnificent grazing acres.

(Left to right) M. R. Frierson, George B. Hagood, and B. Y. Palmer examine a bundle of seedling pines soon to be planted in Fairfield County.

All over Fairfield today are fine pastures. There are 27 Grade-A dairies in the county. These dairy farms must, of course, have fine pastures. With the able assistance of the men of the Soil Conservation Service, the dairy farmers have excellent programs going to maintain good pastures and to grow feed for winter feeding.

Good pastures must have water for the cattle and there are now 339 ponds in Fairfield, which

is not a large county. SCS men helped design 99 ponds in 1955. This indicates ponds are being provided at a higher rate per year than ever before.

Since the depression of the late 1920's and early 1930's, Fairfield has been virtually made over agriculturally. Cotton production has dropped from an average in those years of about 30,000 acres a year to 5,000 acres in 1955.

In 1955, it is estimated that Fairfield's income from agriculture was procured as follows:

| | |
|---|---|
| Pulpwood | $1,000,000 |
| Dairying | 800,000 |
| Cotton | 750,000 |
| Beef cattle | 600,000 |
| Turkeys | 250,000 |

This comes to 3.4 million and does not include miscellaneous income from the sale of hay and grain and other crops. It shows, however, the principal sources of the healthy farm income of the farmers today.

The men of the Soil Conservation Service look with as much pride and satisfaction on the achievements of the revolution as do the farmers themselves, and these farmers are quick and vigorous in their praise of these men and of the whole idea of the soil conservation program.

By late afternoon on the day of our visiting of farms we arrived at the home of S. D. Cathcart. He is also a district supervisor and an authority on dairy and other farming in the county.

Mr. Cathcart has been in on soil conservation work since 1935, when the CCC began improving lands in Fairfield.

"It's been a great thing for Fairfield," he says of the work of the SCS.

All over the county there has been improvement and the improvement is continuing. There probably is not a better example in the State, of men accepting new farm concepts, going to work on them, and making them succeed.

You can see the effects not only on the lands, but in the houses and barns.

And the Merchants and Planters Bank reflects it impressively. As late as 1937, the resources of that bank stood at approximately $750,000. Today its total resources are more than $3¼ million. There it is—in cold figures—the best evidence of a great agricultural transformation.

**Some leaders of the Fairfield County agricultural revival: (left to right) G. M. Ketchen, George B. Hagood, S. D. Cathcart, William Jeter, and H. E. Johnson.**

# *Soil is Key to Range Capability*

By ROBERT W. EIKLEBERRY

DIG a hole and draw a crowd! If you want to interest a landowner, get out with a spade and start shoveling dirt in one of his prize pastures or problem fields. If he sees you, chances are that he will stop what he is doing and come out to talk. His first question may be, "Looking for oil?—or maybe uranium?" Yes, the soil is a common meeting ground for scientist and layman.

Out here in the Great Plains range conservation has moved a long way since 1940. One of the reasons has been a better knowledge of soils. Range conservationists used to talk mostly in terms of vegetation types, density, palatability, and forage-acre factors. Today, they talk in terms of range soils and the condition of the vegetation in relation to its potential. "Range site" and "range condition" are familiar factors to successful ranchers. The two go hand in hand in determining the range capability now and in the future. Proper stocking is best determined by knowing both the site and its vegetative condition.

To determine range capability, the plant scientists and soil scientist must work together. A good range conservationist must be a student of soils. Conversely, in the range areas, a good soil scientist must have considerable knowledge of plant ecology. Frequently, it is impossible to determine the climax vegetation which should be on a specific range out here in the Great Plains without knowing the soils. For example, many people believe that a solid cover of buffalograss on the deep, medium-textured loess soils in the 15- to 19-inch rainfall belt of the Northern Plains is natural. Well, it isn't. Buffalograss should make up less than 10 percent of the natural vegetation on these soils. Western wheatgrass (*Agropyron smithii*) is the dominant grass on these soils when properly managed and on range in excellent condition. Adjacent deep sandy soils may be covered with sand dropseed and blue grama, but little bluestem and prairie sandreed should make up over 75 percent of the composition on these soils. To determine range condition under native vegetation, you must know the soil and the climate in relation to the kind and composition of the grass that grew there originally.

During the past few years, E. J. Dyksterhuis and Ralph O. Lewis, range conservationist and soil scientist, respectively, have worked closely together on this problem in the Northern Plains States. Comparable teams of range and soils men have worked on similar problems in the Mountain States, the West, and the Southern

Note: The author is soil correlator, Soil Conservation Service, Lincoln, Nebr.

Good cattle on sandhills range. The small lake showing at the left is typical of this area.

Choppy sands range site. Left, poor condition; right fair condition.

Plains. They have arrived at a set of interpretive groupings in which they can place the soils studied to date. These groupings within each climatic belt are called range sites. A range site is a combination of soils and climate that produces a certain kind and amount of native vegetation. Only soils which normally produce native pasture can be classified into range sites. Here in the Northern Plains, each of the soils can be placed in one of the following range sites:

WL—WET LAND: Subirrigated land with water table at or close to the surface part of the year but not open-water marsh.

DS—DARK SANDS: Sands having a thick, black humic upper soil because of favorable subsoil moisture, but water table seldom closer to surface than 18 to 36 inches.

Ov—OVERFLOW (formerly called Lowland): Areas regularly receiving additional moisture from higher land—stream overflow and run-in from higher slopes, and areas with water-spreading systems.

SL—SALINE LOWLAND: Overflow or subirrigated land affected by salt accumulations.

Sa—SANDS: Deep, loose, coarse-textured soils predominantly sand on gentle slopes.

Sv—SAVANNAH LAND: Uplands that originally supported isolated trees in natural grassland. Soils supply more and deeper soil moisture than average for the climate because of high intake at the surface and commonly also a slowly permeable layer several feet below. Bedrock is never near the surface as on the "Very Shallow" site, which also may support stunted trees rooted in joints of bedrock.

Sy—SANDY: Normal sandy loams and loamy fine sands.

Sl—SILTY: Normal loams, silt loams, silts, and fluffy clay loams.

Cl—CLAYEY: Normal clays and compact clay loams.

Cp—CLAYPITS: Areas where hard clay lies close to the surface in shallow pits which occupy more than 20 percent of the area.

CS—CHOPPY SANDHILLS: Deep, loose, coarse-textured soils, predominantly sand, with abrupt slopes of 20 percent or more.

St—STONYHILL: Deep, thin soils with much loose rock on strongly to steeply sloping outwash or hilly land. Stoniness—not bedrock or gravel—makes tillage of intertilled crops impractical.

Sw—SHALLOW: Soils having at least 10 inches of soil but few roots penetrate deeper than 20 inches.

TL—THIN LOESS: Shallowly developed loess soils on slopes of 20 percent or more.

TB—THIN BANKS: Poorly developed mixed soils derived from various parent materials that outcrop at different levels forming irregular slopes of from 20 to 65 percent. Trees may occur locally on outcrops. (If desired, breaks generally over lime-

stones may be designated Thin L Breaks, and over sandstones as Thin S breaks.)

Gr —GRAVEL: Uplands in which rock fragments of gravel size are so abundant in and on the soil that a sharp-pointed spade cannot be forced into the soil. Included are some river terraces and outwash deltas.

VS—VERY SHALLOW: Soils where few roots can penetrate deeper than 10 inches, but usually with some joints in bedrock that develop deep soil pockets. These joints are usually marked by tall grasses, shrubs, or trees. Included is most scoria land but not shale outcrops.

SU—SALINE UPLAND: Upland soils with excessive accumulation of salts. Common only in arid climates.

Sh —SHALE: Uplands where shales are exposed at the surface and little, if any, soil profile development is evident.

Bl —BADLANDS: Rough, broken lands with intermingled grazable areas too small or too narrow to justify separate consideration.

These 20 groups of range soils can occur in 5 rainfall belts and through changes in latitude as roughly divided by boundaries of States from Texas to North Dakota. Thus, they provide an opportunity to recognize up to 500 different kinds of range sites.

This looks like a large number of different kinds of rangeland on which to make recommendations. But let's take a look at one large range county in Nebraska. Cherry County has been covered by a recent standard soil survey in which all the soils have been classified into range sites. There are 39 soils occurring in this county. These 39 soils were grouped into 10 range sites. The rangemen then prepared a table of suggested stocking rates by site and condition classes. This shows the number of acres required per mature cow for the 6-month grazing season or equivalent for each site in its present condition. These range sites and stocking rates are summarized in the table below.

By determining the range site, and then observing range conditions on the area in the field, the range planner can recommend the appropriate starting stocking rate for any given piece of land.

The dominant grasses of an area under climax usually consist of four or five kinds. Our present knowledge and experience indicate that on most rangelands in the United States we can expect to get the greatest production over a long period of years when native pastures are maintained as near as possible to a climax cover of grasses. In order to do this, there are some definite principles of range management that must be followed. These requirements are

**Range sites and stocking rates, Cherry County, Nebr.**

| *Range site* | *Dominant grasses when range is in excellent condition.* | *Stocking rate by condition classes; acres per mature cow, 6-month period.* | | | |
|---|---|---|---|---|---|
| | | *Excellent* | Good | *Fair* | *Poor* |
| Wet land | Bluejoint reedgrass, prairie cordgrass | 3.5 | 4.5 | 7.5 | 15.0 |
| Subirrigated | Switchgrass, Indian grass, big bluestem | 5.0 | 7.0 | 11.0 | 22.0 |
| Overflow | Big bluestem, western wheatgrass, switchgrass | 7.5 | 10.0 | 15.0 | 30.0 |
| Sands | Switchgrass, prairie sandreed, sand bluestem, little bluestem | 10.0 | 14.0 | 20.0 | 40.0 |
| Sandy | Little bluestem, prairie sandreed, needle-and-thread, sand dropseed | 10.0 | 14.0 | 20.0 | 40.0 |
| Silty | Western wheatgrass, blue grama, green needlegrass, needle-and-thread | 10.0 | 14.0 | 20.0 | 40.0 |
| Choppy sandhills | Prairie sandreed, sand bluestem, sand lovegrass, little bluestem | 12.0 | 16.0 | 24.0 | 48.0 |
| Shallow | Blue grama, dryland sedges, needle-and-thread, sand dropseed | 12.0 | 16.0 | 24.0 | 48.0 |
| Thin breaks | Little bluestem, prairie sandreed, sideoats grama, stony hills muhly | 15.0 | 20.0 | 20.0 | 60.0 |
| Very shallow | Blue grama, dryland sedges, junegrass | 30.0 | 40.0 | 60.0 | 120.0 |

quite simple, yet rigid. These four principles are briefly listed as follows: (1) Proper number of livestock, (2) uniform distribution of grazing, (3) proper season of use, and (4) proper kinds of grazing animals.

In areas of "annual range" the application of fertilizer has proved successful. Here is where the range conservationist and the rancher sit down and plan a program of grazing management for the ranch. The range conservationists of the Soil Conservation Service have been very successful in using this approach. In some places, where soil surveys have not been made, the range conservationist has been trained to recognize the soils well enough to make a range-site map. The Soil Conservation Service has found that looking at range vegetation is not enough. We must first know the soil to determine what kind and how much vegetation it will produce. Soils and climate are the key to successful range conservation. We must know the soil in order to know if the present vegetation reflects potential productivity or if it is merely a stage in the deterioration of a native pasture.

# *An Artist Becomes a Conservationist*

By JACK L. BARRICK

MISS Elizabeth Whipple, an art teacher at Salem College, W. Va., first heard of the Salem Watershed protection project at a club meeting. Since then, she has used her talents to promote this project.

When she learned that drawings were needed to illustrate a brochure to tell the public about the watershed project, she volunteered her services. The results were certainly attractive, as you can see from the samples shown here. She learned of this need from a college associate, Harley Bond, who is a director of the Upper Tenmile Watershed Association and is also treasurer of West Fork Soil Conservation District. These organizations cosponsor the Salem watershed project.

Note.—The author is work unit conservationist, Soil Conservation Service Clarksburg, W. Va.

Floods.

Before long, the cleverly illustrated brochure "Action on Salem Fork" was ready for public distribution. Farm and town dweller alike in the Salem area read the story. They learned of ways to share in the work and cost of the project. After reading the brochure, townspeople better understood that only action was needed to bring about a reduction of damages from floods. Farmers could foresee added values through more intensive use of soil and water conservation practices on their land.

Miss Whipple says that one reason she was especially interested in doing the drawings for the brochure was to see if she could develop a technique for drawings that would reproduce well when reduced in size and printed by inexpensive methods. She used scratchboard for all but 1 of her 6 drawings. Realistic drawings with an appeal to the average reader, yet stylized enough to apply to almost any West Virginia area, were her aim.

Conservation.

Miss Whipple, dean of women at Salem College, attended the Cleveland School of Art for 5 years. She majored in portrait painting. While she likes portrait and still life painting best, her art interests are many and varied. Thus, she undertook to draw six conservation sketches for the watershed brochure.

Harley Bond was her main source of information on conservation and watershed questions. After a field trip to a few points of interest Miss Whipple became "very much interested in any project that will improve and enrich our community." She added, "I think the Salem watershed project is more helpful and promising in that respect than anything else we have undertaken here in years."

**Elizabeth Whipple.**

Miss Whipple believes that drawings are especially useful in soil conservation work. She explained: "They show expected results, slightly idealized. One might have to wait several years before photographs could show the same results." She emphasized that an artist can point up some special aspect of the work which might be hard to show in photographs. "Drawings can't take the place of photos, but can supplement them," she remarked.

# Conservation on the Bluestem Hills

***An oil field worker and his energetic wife rejuvenate 440 acres of depleted land in the Bluestem Hills of Kansas and build a good way of life while doing so.***

By JAMES G. MOOREFIELD

"YOU mean this fine bluestem meadow used to be cropland?" a farmer exclaimed. The occasion was a land use tour of the Lena-Long Watershed sponsored by the Greenwood County (Kans.) Soil Conservation District. The scene before the group of farmers attending the tour was a lush meadow of native bluestem grasses. The farm owner, James C. Shewmaker's explanation that over one-half of the 40-acre meadow had been artificially reseeded to bluestream grasses amazed the group. It was virtually impossible to distinguish the reseeded area from the virgin sod.

Behind the remarks of the astonished farmer lies a story of how one family by hard work, faith, and determination made a dream come true. It is an interesting story which began many years ago.

In 1926, Jim Shewmaker moved onto his newly purchased farm with his wife, Julia, and 5-year-old son, Dwight. The Shewmakers were young and ambitious. The 80-acre farm in the beautiful Bluestem Hills of Kansas, had a reputation of being a rundown farm. It was all sloping upland: 40 acres of eroded cropland and 40 acres of deteriorated native bluestem pasture.

The energetic and ambitious Shewmakers realized the impossibility of making a decent living on the farm. Also, the 80 acres comprised only the beginning of the farm of their

Note.—The author is work unit conservationist, Soil Conservation Service, El Dorado, Kans.

dreams. Jim had a job as a pumper in the nearby oil fields. He commuted daily to his job and worked the farm in the evenings and on weekends. Julia worked hard in the house and fields.

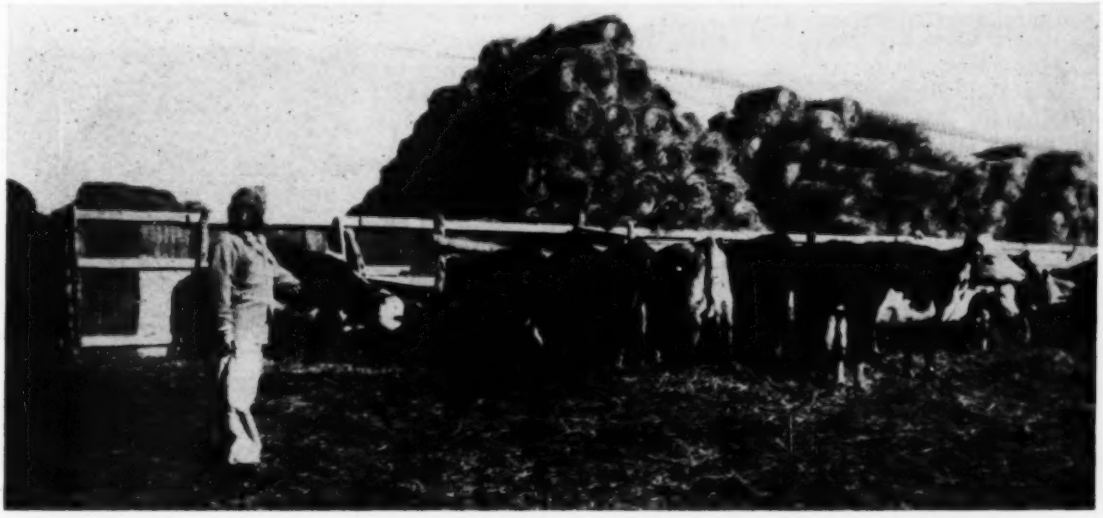
In the meantime, Jim was following the locally common farming practices on the upland—a rotation of sorghum and small grains. A couple of years of this convinced him that this was not sound agriculture. He and Julia talked it over and decided to build up a beef herd. But they knew they would need more pastureland to succeed. Jim reasoned that to have and maintain productive pastures, they should be thoroughly acquainted with the grasses adapted to the community.

The oil wells that Jim pumped generally were located in native bluestem grasslands. Thinking more and more of grasses, he became interested in the native grasses that grew so luxuriantly along the trails connecting his wells. During his spare moments, Jim studied these grasses closely. His interest aroused, he wrote to the State Board of Agriculture for a copy of a book on grasses in Kansas. He acquainted himself with the primary native grasses of the Kansas prairies and became convinced that in these grasses lay the answer to their problems. But he and Julia knew they would need more land.

**Jim and Julia Shewmaker in one of their bluestem meadows.**

Prospects looked dark when the Great Depression and the drought of the thirties struck. The arrivals of son Carl and daughter Genevieve made money more important. But family additions served only to stimulate their efforts through the adverse weather and economic conditions. Jim and Julia simply extended their timetable.

(Continued on p. 259)



**Julia Shewmaker tending the cattle herd while husband and son were away during World War II.**

# Conservation Prob

By B. W[illegible]RED

PERSIA is a land of variable climate, soil, vegetation, and topography that presents a maze of intriguing problems to test the ingenuity of the land management conservationist. Here a civilization has survived thousands of years of political strife that has heaped hardships on a rugged soil and a hardy people.

Persia lies between the Caspian Sea on the north, the Persian Gulf on the south, Iraq on the west, and Pakistan and Afghanistan on the east. Tehran, the Capitol City, lies at the foot of the Elburz Mountains at about the same latitude as Oklahoma City, Okla. The Plateau of Persia is boxed in by high mountains with small lowland areas near the southern end of the Caspian Sea and other lowlands near the Persian Gulf. This great plateau is an inland basin similar to the Great Basin of Utah and Nevada. Annual rainfall varies from 1 to 15 inches. Topography and elevation are similar to the Great Basin and southwestern United States. Climate resembles southern California, except in the southern Caspian area where rainfall distribution is more even throughout the year and reaches upward of 70 inches annually. There are no large rivers, and most Persian streams have no outlet to the sea.

Persian mountain systems are immature and rugged. Much of the exposed rock is limestone, presumably of Tertiary age. Rocks of igneous origin are common in places. Mt. Demavend, in the Elburz Mountains, northeast of Tehran, is an 18,600-foot high volcano. It is perched like a snow-covered inverted cone on top of the bulk of the Elburz Mountain mass. The Elburz chain extends from west to east across northern Persia and ranges in height from 6,000 to 18,600 feet. The Zagros Mountains shunt southeastward along western and southern Persia. Some of these peaks reach to 14,500 feet.

Note.—The author is soil conservationist, Soil Conservation Service, Washington, D. C. The material for this article was collected while he was on detail with International Cooperation Administration in 1955 as training leader of a range training course in Iran for students from Iraq, Iran, and Pakistan.

Both climate and geographical position have been ruling forces in the history of Persia. The Cain and Abel struggle between farmer and stockman began several thousand years ago when droughted-out nomadic herdsman invaded and subdued farmers in the irrigated areas. This seesaw struggle went on relentlessly for ages with drought and heavy grazing decimating the herds of the nomads, and nomad invaders plundering the villages until conditions on the ranges improved enough for herds and flocks to return again to the ranges.

Persia has the misfortune of lying across the natural pathway between the heavily populated areas of southern Asia and Europe. Conquerors from East and West have forever trailed both ways through Persia on military expeditions, hence she has been deviled by foreign interlopers for at least three thousand years.

Together the cumulative effect of internecine warfare between nomads and villagers and the raping and killing by foreign conquerors have exerted a tremendous strain on the natural resources of Persia and adjoining countries.

Diversion dam on the Kor River in sou[illegible] Persia, bui[illegible]

# Problems in Persia

B. WILRED

To help improve conditions for our Nation's friends in the world, United States technical assistance has been extended to many countries. One of these efforts was a three-nation school in land management ecology sponsored by the United States International Cooperation Administration and Persia, Iraq, and Pakistan. The school was held in the spring of 1955 in Persia with headquarters in Tehran. The teaching staff was recruited from United States range scientists, Middle East International Cooperation Administration missions, and the Department of Agriculture of Persia. There were 29 students from the three nations, most being selected college graduates. Part of the training was done in classroom work at the University of Tehran, but much of the instruction was given during field trips to the Caspian area and to the Hamadan area in western Persia.

The people of Persia live deeply within tradition, and we unexpectedly witnessed a demonstration of it in deference to us the first day our college-on-wheels left Tehran for the Caspian area. The ceremony took place on a high pass in the Elburz Mountains at an ancient rock-walled caravansary at Godook, a stopping place for caravans, shepherds, and cavalry for ages.

out Persia, built about 1,100 years ago.

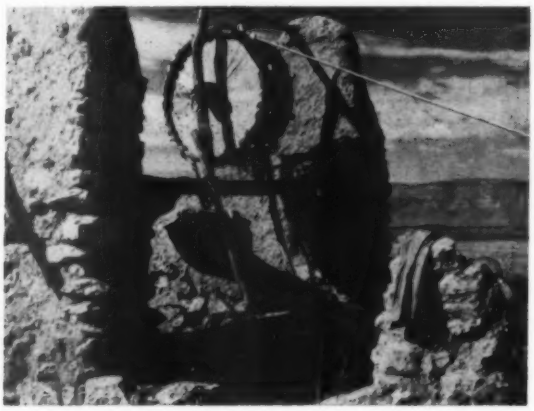
A delegation from the Caspian country welcomed us with a blood sacrifice. A young goat strung to a pole was the victim. We were welcomed in fluent Farsi by the leader of the Caspian expedition. Our host pointed to the headless young goat and bade us health and success on our trip through the marvelous Caspian country but wished our enemies the fate of the sacrificed goat. We had a marvelous trip.

Persians have always called their country Iran, the land of the Aryans, and changed their country's name from Persia to Iran in 1935. The first inhabitants of historical times, three thousand years ago, were members of the Indo-Iranian branch of the white race. Their speech was Aryan or Indo-European; their main religion was that of Zoroaster.

Then they were conquered by the Assyrians, to be followed by 18 years of domination by the Median Empire. Later Persia became a conquering nation under Cyrus the Great, 600-529 B. C. Cyrus spread his empire to include all lands between the Indus and Nile Rivers and as far north as the Black Sea.

His son, Darius the Great, succeeded him in 521. Both Darius and his son, Xerxes, failed to conquer the Greeks. A few generations later Alexander the Great of Macedonia retaliated by conquering the former empire of Cyrus, about 330 B. C. The Macedonians ruled most of Iran for nearly 200 years. Then the Parthians, from central Asia moved in as conquerors and rulers for nearly three centuries, until the Sassanian Persians took over around A. D. 226 and ruled until the conquering Arabs came in the seventh century and forced the inhabitants to adopt the Islamic religion and give up the ancient worship of Zoroaster.

During the 13th century Persia was brutalized and plundered by hordes of Mongols under chieftains like Ghenghis Khan. Then Tamerlane came, and later the Turks.



**Irrigation through horsepower in Persia: (above) horse draws the water, (below) goatskin bag of water emptied into irrigation ditch.**

Finally in 1923, after stormy centuries of foreign domination the country came into its own again under the leadership of a young cavalry officer, Reza Shah Pahlavi. His oldest son is presently the Shah of Iran.

The people of Iran have come through thousands of years' turmoil with a strong sense of national pride. Farsi, the national language, has survived but the transplanted religion of Mohammed is the basic religion with the Shiah sect strongly dominant. The people are excellent hosts and have a pleasant sense of humor. They are a deliberating race and not easily stampeded. They can take another day to solve a problem. They have a word for it, bookera—meaning tomorrow.

Eighty percent of the people are nomads and rural villagers; 20 percent live in cities. There are numerous tribes, the largest being the Kurds, Lurs, Bakhtiaris, and the Ghashgais, all of which live in the general area covered by the Zagros Mountains.

Persia has about 628,000 square miles of land. Most soils were originally developed as semiarid grasslands. Although not very high in organic matter, they produce good native grass crops with the winter rainfall that prevails. River-valley soils that were developed under abundant grass that formerly grew there are surprisingly fertile, even after hundreds of years of farming. Mountain soils are shallow and low in organic matter but produce excellent native grasses and legumes. Desert soils, abundant in the interior Persian plateau, are unstable and low in organic matter—large areas being covered with drifting sand dunes. There are large areas of sterile salty sinks resembling the Sevier Lake in Utah and Carson Sinks in Nevada. Soils under the lush hardwood forests of the southern Caspian area are largely of limestone origin and are slightly acid to neutral. They are extremely productive; some lands have been producing surprisingly good crops for centuries without the addition of fertilizer.

Erosion is paramount, being greatest on steep mountain slopes and on dry, sandy areas. Dust storms occur regularly throughout the summer in the central plateau where rainfall during that season is rare.

Buildings built by ancient Persian civilizations are buried beneath the sediments that have eroded from adjacent hills and flood plains. For example, the 20-foot foundations of the Persepolis, Darius' ceremonial palace, burned by Alexander during the third century B. C., was completely covered by soil eroded from the adjacent Mount of Mercy. This famous limestone mountain was productive grazing land in the time of Darius. Today it is an almost soilless limestone skeleton. Excavators are still digging out parts of the Persepolis from under its overburden of washed-in sediment.

About 12½ million acres are farmed, one-third being irrigated. About 6 or 7 million acres are in productive forests near the Caspian Sea. The remainder is range, desert, or inaccessible mountain crags.

Small as they are, the rivers of Persia are of inestimable importance to a country with so little water. The Elburz and Zagros Mountains are the main watersheds.

The river systems can be developed into productive and serviceable natural resources through conservation on the watersheds plus adequate storage developments, irrigation diversions, and conservation-irrigation works. At present most watersheds are severely eroded and stream valleys are gutted and strewn with rubble; floods are destructive and the water supply is undependable.

Too little has been done to develop springs and build stock ponds for livestock operations. However, there's one notable water development for which the Middle East and especially Persia is noted. This is the ganat—a battery of wells connected by underground canals which are brought out on grade to the surface to supply irrigation and domestic water for villages. Ganat makers dig wells into water-bearing sands or gravel and connect these wells with subterranean canals. Soil from the underground ditches is hoisted in baskets to the surface by ropes pulled by hand or windlass. The dirt is piled around the holes and the combination resembles doughnuts when observed from an airplane. Ganats are large enough for a canal digger to stand upright during construction and maintenance. Depth varies from a few to several hundred feet. The deepest ganat is around one thousand feet. There are about 50,000 of them; the largest extends about 30 miles, and it has been estimated that some have been yielding dependable flows of water for two thousand years.

There are strange contrasts in methods of water development for irrigation. Near the Persepolis are numerous shallow wells where sugar beets and other crops are irrigated with water raised in goatskin bags or buckets. The buckets are elevated by ropes drawn over crude pulleys by horses. Adjacent, on the Kor River, is a large and effective masonry diversion dam complete with distribution ditches built by Persian engineers about one thousand and one hundred years ago. This system has been in continual use with little requirement for repair or maintenance.

The four major natural plant communities varying from desert to humid forest are: desert, grasslands, savannah, and forest:

1. The desert community is made up largely of desert shrubs, annual grasses, and forbs; shrubs and forbs prevail. The desert community lives in the interior basin and annual rainfall varies from 1 to 5 inches. True desert occupies 10 to 15 percent of the country. Little study has been made of the vegetation. Some of the plants are related to mustards, Russian thistle, wild lettuce, wheatgrasses, and needlegrasses.

**Nomad family milking fat-tail sheep near the Zargos Mountains.**

Firewood on its way to market in Shiraz, Iran.

2. Grassland is the most extensive plant community. Cool season plants predominate because of winter rainfall conditions and dry summers. Perennial plants still are most common despite the fact that most of the ranges are in poor condition. The range in species of plants varies greatly within moisture belts, but the same plant genuses are paramount in most of the rainfall zones which produce grass. For example, most of grassland moisture belts have species of wheatgrass, brome, fescue, bluegrass, needlegrass, and orchardgrass. The same situation is true of forbs, particularly legumes of both annual and perennial types. The legumes include species of alfalfa, clover, sweetclover, burclovers, medics, and so on. In fact, most of the cool season plants that were imported years ago for use in the United States are found growing native at various elevations and temperature belts in Persia and Iraq.

Annual plants including bromegrasses, wild barleys, and others, make up a considerable amount of the cover on rundown ranges but were seldom seen on the few ranges that are in good and excellent condition. Bermudagrass, a warm season plant, is the most widely distributed grass of all. It grows from sea level to 7,000 feet elevation on some mountains.

The actual needs for replanting are restricted primarily to ranges near villages, where constant close cropping for generations has killed off the desirable perennial range plants. These acreages are small in comparison to the vast ranges that can be brought to a high state of perfection by sound grazing practices alone.

Already it has been found from planting trials that these denuded lands can be seeded and made to produce again. The wheatgrasses, such as crested and intermediate, have been seeded with stock imported from the United States. These same plants are native in Iran and plans are being made to protect and harvest native stands for local seed sources.

First estimates were that most Persian ranges would need replanting because they looked so depleted. But after enough sample range areas were fenced against animals and rested, it was learned that enough good grasses, forbs, and shrubs remain alive on most ranges to restore them naturally, provided light stocking and growing season rests are used.

3. Savannahs are small in area and are restricted to high elevations in the Zagros Mountains and along the transition zones between forest and grassland in the Elburz Mountains. Rainfall conditions in savannahs are excellent for grass, fescue, and wheatgrasses are native to this habita. Savannah sites represent, minimum habitats for trees. Several species of oak, cypress, and juniper are the major wood plants of the savannahs. These are used for charcoal, wood, and building material.

4. The hardwood forests of the Caspian section are of great importance to Persia. In fact this is the only area of commercial timber in the countries of Persia, Iraq, Jordan, and Arabia. Some of the land nearest the Caspian Sea has been cleared and is farmed and pastured. Many forests near the towns and cities have been mutilated for ages, and only shrubby growth remains, and this is harvested continually for fuel and small building materials. Until recently, forest products were transported on the backs of mules and donkeys, hence large parts of inaccessible forests have remained in their virgin state. Rainfall is from 30 to 70 inches and tree production is high. Species of oak and beech are important commercial types but dozens of other kinds are available.

Visitors at a nomad camp near the Elburz Mountains.

5. There are small areas of tundra in some mountain tops but area-wise they are of little significance. Little is known of this vegetation, although species of legumes, bluegrasses, and fescues have been observed.

The visitor to Persia cannot help but be astonished at the durability of both soil and vegetation in a land where farming and grazing pressures have been so acute for thousands of years. However, the resurrecting powers of both land and grass are immense when proper care is given.

Persians depend greatly on their crops for sustenance and a wide variety is produced. The main crops are wheat, barley, rice, tobacco, opium, cotton, sugar beets, sugar beet seed, tea, and hay.

The following fruits are important: grapes, dates, olives, citrus, apples, cherries, peaches, apricots, and pears. Nuts are grown and large amounts are exported. These are pistachios, almonds, and hazelnuts.

Greater crop production is sorely needed to feed the people, but there are numerous opportunities available to accomplish this through better soil conservation, seed improvement, and greater irrigation development. Except in the Caspian area most of the plowing is done with ironshod wooden plows, pulled by small underfed oxen. Transportation of products on the farm is largely on the backs of the laborers and donkeys. Large acreages of roughage need to be produced on the croplands to provide feed for both village and nomad livestock.

Persia is largely a range country and most of the livestock are raised by nomads who summer in the mountains and winter in the lowlands.

Livestock numbers are estimated to be as follows:

| | |
|---|---|
| Sheep | 21,650,000 |
| Goats | 9,730,000 |
| Cattle | 3,150,000 |
| Donkeys | 3,000,000 |
| Horses | 450,000 |
| Water buffalo | 194,000 |
| Camels | 100,000 |
| Mules | 93,000 |
| Pigs | 32,000 |
| Poultry | 25,000,000 |

Nomad stockmen are friendly and hospitable. They move their herds and flocks up the mountains in spring as the grass and other forage greens up. They graze back to winter in the warmer lowland ranges. Everything they own is transported on the backs of donkeys and mules, with cattle sometimes being used for pack animals. Cows, ewes, and nannies are milked and milk is used directly as food or converted to yogurt or cheese for future use. Sheep are the most common nomad animal. Fat-tail sheep are the most numerous.

The gray-black tents lived in by nomads are made from goat hair woven by the women. Nomads generally are happier and better fed than farm-village laborers.

**Excavated ruins of the Persepolis with Mount of Mercy in background.**

Adapted livestock breeds from America are being used in grading up the size and producing power of native animals—artificial insemination is being used widely by local Persians trained for the work.

Better livestock development has made it necessary to start a program for increasing the quantity and quality of forage resources to care for these bigger and better animals that require more feed and care than the native animals that have been conditioned to harsh conditions for centuries.

When put into the perspective of the past, Persia has emerged as an independent nation after thousands of years of barbarous conquest by foreigners. The pressures from the past have sapped her natural resources, but have not killed the compelling urge of her people to recreate the nation into the type of splendid prosperous country that existed when Darius reigned.

The nation, particularly the Iranian Department of Agriculture, is busy trying to reconstitute a strong agriculture which is essential to their national welfare. They are drawing considerably on the friendly technical help from the United States to help bring this about. The hopeful sign is that a crop of eager young Persian technicians are being developed to take over the responsibility of building Persia's agriculture.

# *This District Stands Apart*

By KENNETH W. SHANKS

THE Lake County (Colo.) Soil Conservation District deserves to be called unique. First, only one-twelfth of its total area is in private ownership and, second, all of its irrigated land is about 2 miles above sea level.

This district lies in a high mountain valley surrounding the historic mining town of Leadville. The lowest elevation is 10,000 feet and the highest points are Mount Elbert and Mount Massive, which reach to 14,431 and 14,418 feet, respectively—the highest peaks in the Rockies.

The 25 landowners in the district include the Forest Service, the Bureau of Land Management, the State of Colorado, and one irrigation company. There are only 13 operating ranches. The district's total area is 239,000 acres, of which only about 20,000 acres are in private ownership.

At first glance this looks like an ideal situation for getting all the needed conservation work, both vegetative and structural practices, established in short order.

For example, there are only 1,500 acres needing drainage and 3,500 acres needing leveling for application of irrigation water; 32 large irrigation structures are to be built, and 6,000 acres of mountain meadow hay land to be renovated and reseeded for production of high quality forage. These are but 4 of the 22 required practices.

A little closer look, however, reveals some serious problems. They are of a kind calling for considerable research. Practically all the soils are light—sand and silt, with gravel, cobblestones, and rocks right up to the surface; hard to plow. These soils won't hold much water. If irrigation water is kept off the meadows for very long, the meadows dry up. This means that subsurface water-table control is necessary. There are, too, deep and extensive peat bogs in the meadows. If the existing poor plant cover (mostly rushes and sedges) over these bogs is killed by plowing, how is a new stand of grass to be established? There are other problems also, such as an average growing season of only 80 days, and 12 feet of snow each winter. The average last frost is June 17 and the first around September 7. The only time that ranchers have a slack period is when snow is on the ground.

But the district is making good, if slow, progress. Pete Cavalli, for example, has increased his hay yield of timothy and alsike from 0.2 ton per acre to 1.17 tons by good management practices alone. George Loomis, another cooperator, has repossessed 80 acres of grazing land by drainage. What these ranchers are doing is typical here.

Note.—The author is area conservationist, Soil Conservation Service, Pueblo, Colo.

## CONSERVATION ON BLUESTEM HILLS

(Continued from p. 251)

During the summer of 1938, weather conditions were ideal for the production of bluestem grass seed. The well managed native pastures and meadows became seas of waving seed heads. The Shewmaker's got busy. When winter arrived, they had harvested tons of seed on the home place and on neighbors' land. They sold and shipped seed throughout the range area. However, they kept enough for their own use.

In the spring of 1939, Jim and Julia started their grass program by seeding 25 acres to bluestem grasses. The field selected had been in row crops for several years. A clean seedbed was prepared and the bluestem seed broadcast by hand. This was a pioneer project in the Bluestem Hills. Residents did not believe it possible to seed bluestem. Only Mother Nature could do that. But Jim and Julia believed if you helped Mother Nature she would help you. They were right. The rains came at the right time and a good stand of grass resulted.

In 1940, an adjoining quarter section of land was purchased. This tract contained 90 acres of eroded cropland, the remainder being depleted native grassland. The former owner for years had rented it to a local horse trader, who had used the pastures to hold large numbers of horses and mules between trades. Only remnants of the climax grasses remained when the Shewmakers acquired the farm. Invading weeds and grasses were abundant.

The Shewmakers had been casting wishful eyes toward this one-hundred-sixty for years. Their plan of action was ready. The main objective was to plant 50 acres of the eroded cropland to permanent pasture, 20 acres to bluestem, and 30 acres to cool season tame grasses for winter pasture. The stocking rate on the 70 acres of abused native pasture was adjusted to the growth habits of the remaining climax grasses to return them to normal production.

Slowly the productivity of the farm was increased. The original pastures were producing luxuriant forage. Bromegrass and alfalfa were growing in the crop rotation for winter pasture and hay. The newly seeded bluestem grasses were producing prairie hay for winter feed. A small beef herd had been built up. Farm income had become substantial. Jim decided to resign from his oilfield job and devote full time to the farming operations.

With the entrance of the United States into World War II, the Shewmakers had a serious family council. Jim felt that he should do more than remain home on the farm and Dwight was ready to enlist for military service. Within a short period, Jim was at Pearl Harbor laboring on the naval base and Dwight was in uniform. Julia assumed responsibility for the farm oper-

**The Shewmakers in a wheatfield, with their home in the background.**

ations. Fourteen-year-old Carl and eight-year-old Genevieve were her assistants.

The war finally ended and Jim and Dwight returned to the farm, but then Carl was in military service. Dwight bought the 200-acre farm across the road and moved there with his young wife. Jim and Julia resumed their prewar methods. Another eroded field was planted to bluestem and 40 acres were planted to brome and Kentucky-31 fescue for cool season pasture. After much discussion, most of the cows were sold and a steer program started. They reasoned that steers would better fit their operations.

In 1950, the Greenwood County Soil Conservation District was organized. Jim and Dwight became early cooperators. But changes and interruptions were still ahead. The Korean War struck and Dwight was recalled to military service.

Genevieve's marriage left Jim and Julia alone on the 440-acre farm.

Still enthusiastic and ambitious, the Shewmaker's pushed on with their plans. Working with SCS technicians, the finishing touches on their conservation program were completed. Terraces, contour farming, stubble mulching, and a grass-legume and small-grain rotation protects all cropland from wind and water erosion. A pasture program to properly use both tame and native pastures is being adhered to faithfully. Stockwater ponds to provide dependable water and assure uniform grazing have been constructed. The last one, completed in 1955, is a beautiful pond with a water depth of 17 feet. The entire pond of more than two acres is encircled by a strong fence and provides recreation and fresh stockwater. The pond will be stocked with bass, bluegill, and channel cat. Also, water from this small lake will be pumped to corrals and buildings.

The Shewmakers have indeed done a commendable job. From 1926 to 1956 may seem like a long time. But to Jim and Julia Shewmaker it has been a short period of hard work, disappointments, happiness, and successes. Starting with a depleted 80 acres, the Shewmaker farm now contains 440 productive acres. Once poor pastures are now in good to excellent condition. Once eroded cropland is now producing luxuriant pasturage. A conservation program has returned all other cropland to high productivity. The livestock carrying capacity of the farm is now double that of the three units at the time acquired. Proper land use has made it possible.

# *Level Water on Sloping Land*

By F. A. MARK and CECIL McCORMAC

WATER runs down hill, but the best way to irrigate is on the level. It's not a new idea, though it's new in the Northwest. Farmers in the Southwest have been using level irrigation for years because it is the most efficient way to use their sparse water supply.

What is level irrigation? It is done by preparing a field with closed borders leveled to a flat plane. If there is cross slope on the land, the closed level borders are benched on widths varying with the land slope, available water, and soil type.

There are many advantages to level irrigation. It has been used on lands up to 5 percent or more slope in the Southwest. But in the Northwest in the Columbia Basin where SCS technicians have recently laid out more than 3,000 acres of level irrigation for soil conservation district cooperators, it is being limited mainly to lands with slopes of 2 percent or less.

Level irrigation is an important water conservation measure. Even where water is plentiful, such as the Columbia Basin, after you have used 3½ acre-feet, you pay a premium for additional water. Using less water by level irrigation—there is little waste water—prevents raising of water tables and subsequent salinity problems. It saves irrigation man-hours. It eliminates soil erosion. It insures even distribution of water over the entire field, resulting in maximum yields, uniform quality, and uniform maturity of crops. It allows close control

Note.—The authors are, respectively, deputy state conservationist, Soil Conservation Service, Spokane, Wash., and area conservationist, Soil Conservation Service, Ephrata, Wash.

**Level irrigated beanfield in Quincy Soil Conservation District.**

of needed water application, depending on soil depth and stage of crop growth, which may vary from an application of 2½ acre-inches to an acre-foot. Level systems have been installed which operate automatically with electric controls.

The requirements to effectively operate a successful level system are not difficult, but are based on sound, simple engineering and soils data.

As a first requirement, the closed system must be level or nearly level. Ditches must be capable of handling a large volume of water—say from 5 c.f.s., to 15 c.f.s. There must be a large stream immediately available. There must be good structural control. The ideal farm system, especially in light soils, consists of carefully designed and constructed concrete-lined ditches and concrete watercontrol strucutres. However, some farmers are effectively using 6-inch aluminum siphon tubes with earth ditches. If there is an appreciable amount of silt, or silt and clay in the soil, a stable ditch can be built if properly packed during construction.

Let us assume the water supply is 2½ c.f.s., and the soil requires a 5 c.f.s., stream to irrigate a flat field 660 feet long and 65 to 70 feet wide—Columbia Basin farmers are solving such stream problems by building overnight storage reservoirs which provide a good daytime stream and a well-earned night's rest. If you have 80 acres and 2½ c.f.s., continuous supply, by using a night storage reservoir and taking the flow into the reservoir for 12 hours, you can have a 5 c.f.s., stream for 12 hours; or if you store for 16 hours, you can have 7½ c.f.s., for 8 hours. Why break your back over a shovel for 24 hours a day when you can take the job easy 8 hours a day, and do a better job? With a 5 c.f.s., stream you can apply 6-inches of water to 10 acres in a 12-hour day. This will provide irrigation on all the land every 8 days. Shallow rooted or new mown crops will require considerably less than a 6-inch application.

Level irrigation is particularly adaptable on farms having light soils because almost in-

**Irrigation on leveled land with closed borders. Note the uniform depth and advance of water.**

variably, by regular methods, the upper end of the field is waterlogged and the lower end burning up. The longer the run attempted the more chronic is the trouble at both ends of the field. Actually, with level irrigation the length of run may be longer because larger, non-erosive streams of water can be used and the water will reach the lower end of the field much quicker. While water may be ponded several inches deep, depending on the soil and crop needs, it will soak into the soil in 1 to 2 hours. With other types of irrigation the field or parts of it, may be saturated with all aeration stopped for as much as 24 hours, with subsequent crop loss. In addition to crop loss, farm and community drainage become impaired and salinity accumulation intensified.

**Closed borders completed for level irrigation, Quincy Soil Conservation District.**

The usual set of negative arguments may be found among many farmers about starting a new practice. To stop negative arguments about level irrigation demands only one solution—go to the farmer using the system, look at his uniform maturing, healthy crops and ask him what he'd take to change back. He will convince you his decision for level irrigation was sound, and he will be congenial in doing it—because he had a good night's sleep.

# *WHY AGRICULTURAL RESEARCH IN A TIME OF ABUNDANCE?*

By SHERMAN E. JOHNSON

THE people who ask the question assigned to me, "Why agricultural research in time of abundance–" probably should broaden it. Production research is not the only force pushing toward increased output. New reclamation projects, some aspects of the Agricultural Conservation program, the Soil Conservation program, and Extension activities also have production-increasing results and increase production in that way. Some involve additional public and private investments that increase output. But whatever means are used, we must recognize that the chain reaction would be less rapid if these activities also were either slowed down or dispensed with in a time of abundance. Perhaps, therefore, the question is: *Why research, extension, conservation, and reclamation activities in time of abundance?*

I am, by no means, recommending either curtailment or suspension of these activities. Neither am I recommending slowing down or dispensing with production research. In fact, we need much more research to guide adjustments toward a more profitable agriculture. But we should be open to suggestions for changes—in research as well as in other activities.

Let us see if we can sharpen our focus on the question by standing back and taking a new look. To get away from our set focus, let us think of an exaggerated version of the problem. Assume that researchers are about to make a radical discovery that has the potentiality of increasing crop production per acre about two or threefold within a short period of time. Suppose that by adoption of this discovery we would need only half as many people in agriculture as we now have, and that we could meet our needs for food and fiber on only half as much land as we are now using. This assumption may sound fantastic, but to the layman the possibility of harnessing atomic energy would have sounded fantastic 15 years ago. There are rumors now that we are on the threshold of discovering the secret of photosynthesis. I have some difficulty visualizing the potential effects of such a discovery, and I am mentioning it only because the assumption of remarkable increases in production efficiency may not be entirely fantastic.

If a discovery were made that doubled the output from labor, land, and other resources, should we adopt it and make the needed adjustments in agriculture?

Note: The author is director, farm and land management research, Agricultural Research Service, Washington D. C. This article is based on a talk given to the Washington Chapter of the Soil Conservation Society of America on March 13, 1956.

Or should we let such a discovery lie dormant and continue to produce farm products with the old techniques? The latter choice would be comparable to the attempt of the Lancashire hand loom weavers to destroy the power looms that were capturing the markets for the product of their labor in the early years of the industrial revolution in England. The Lancashire weavers were not successful in halting the march of technology. But the transition to the new methods, and the new way of life caused untold misery to more than one generation of British workers, because adequate steps were not taken to cushion the shock of transition.

In my opinion, agriculture in this country must keep step with progress in the rest of the economy in order to attract and retain persons of ability in farm occupations. Our agriculture also must keep step with technological progress in other countries in order to hold our place in world markets Therefore, the only logical choice seems to be to continue research and discovery in the production field, and to utilize the results whenever they become available. But we can direct our applied research toward amelioration rather than accentuation of farm surplus problems. This choice also involves a responsibility of companion research: (1) To appraise the potential impacts of new developments, and (2) to help those disadvantaged by the change to adjust to the new technology or to shift into other employment. The greater the impact of the new development, the greater the need for research to appraise the impact and to work out ameliorating adjustments.

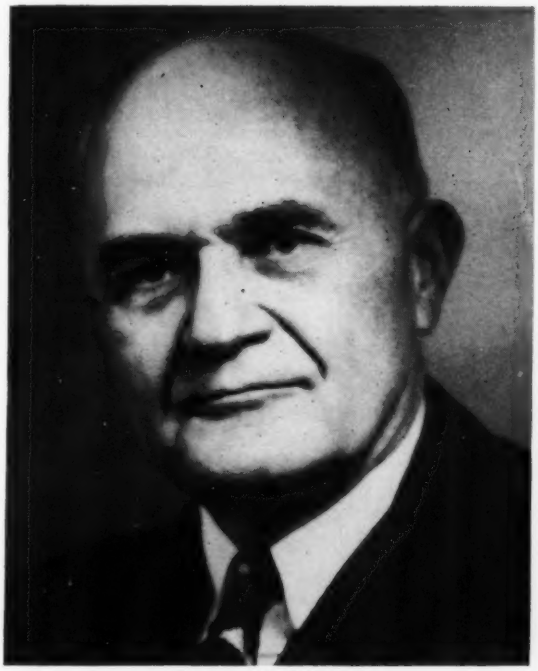
Companion research of this type has been grossly neglected in both publicly and privately supported research programs in this country. We have unconsciously assumed there is sufficient flexibility in the use of farm resources to permit farmers to adjust to the new developments, either by adopting them to their advantage, or by shifting to other employment if they found the going too hard.

Unfortunately, it is not easy for farmers, once committed to farming, to shift into other employment. Neither is it easy to learn new farming skills, nor to abandon heavy investments in prevailing methods of production, especially when the improved methods involve new investments for which neither funds nor credit are available. These and other obstacles to profitable adjustment must be recognized and dealt with in agricultural research and in farm programs.

Over the years technical advancement in agriculture has contributed immensely to public welfare. It has made possible production of food and fiber with much less labor and other resources. Released labor has been available for development of other industries and services in our economy. Further technical advances in agriculture also would be in the interest of public welfare, especially under prosperity conditions, when other employment is available.

But, in view of the fact that the benefits of technical advances in agriculture are so readily shifted to other groups in society, the national interest requires a thorough-going research program directed toward helping those who are disadvantaged by technical or other changes in agriculture that are beyond their control as individuals. Research should not only provide guidance in adjustment to those who continue to find their best economic opportunities in farming, but also to assist those who will benefit by shifting to other employment. But large-scale adjustments of this type don't just happen. They need research guidance and program assistance as well.

Even if production research occasionally causes new problems, we have to recognize that it cannot be turned on and off as needed, the way we regulate the water in a faucet. It is much better to have knowledge gained from research when we need it than to need it and not have it.



Sherman E. Johnson.

Our backlog of unutilized research was a life saver in World War II. We need a reserve of knowledge and a corps of competent scientists who can tackle problems that may emerge without warning. Suspension of production research is unthinkable, but we can and should raise many questions about redirection.

A basic research program to develop fundamental knowledge concerning agriculture needs to go forward at all times and in all fields. But research applied to specific problems can and should be geared to provide maximum assistance on problems that farmers are likely to face in the years ahead.

In looking ahead we need to differentiate between prospects for the next several years and the longer term outlook. We need to recognize that as a result of wartime expansion we have productive capacity more than ample for today's markets. In fact, output in 1955

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was nearly large enough in volume to meet the projected needs of 1960. But we produced much too much of some products and too little of others to balance with potential needs in 1960.

We also need to ponder the narrowness of the margin between abundance and scarcity. What happened after the Korean outbreak could occur again. A new international emergency, or even a serious drought, could change the surplus struggle to a concern over deficits. Even our present large carryover of concentrate feeds represents only about 4 months' supply.

Because of the narrow margin between abundance and scarcity, and because of uncertainties with respect to drought and international developments, we should maintain *reserve capacity* that will permit us to increase output quickly if the need should arise.

*Providing such a reserve calls for much more research on resource protection than is now being carried out.* But we need to distinguish, on the one hand, research that will increase output in the immediate future. In assigning priorities for research, the former should receive the major emphasis.

Research to achieve adequate protection of our land and water resources is extremely important, both as insurance against emergency needs and to provide for possible food and fiber needs of future generations. To do it effectively requires teamwork because we are looking for practices that not only conserve soil and water but also fit into a farming system that is profitable to farmers. This may involve soil and water, crops, livestock, engineering, economics, and perhaps other specialties as well.

Under the conditions we are facing at the present time, protection of our land and water resources involves building up reserve capacity to meet unforeseen *future* needs. This will help provide protection for all of us as citizens. But we are not likely to develop ways that will enable farmers to bear the entire premium cost of such insurance for the entire population. This seems to involve programs such as the proposed conservation reserve, backed up by research to make such programs most effective.

Considering population increases and general growth in the economy, we should be able to achieve a better balance between production and markets than we now have. Recent projections indicate that we may need about a 30 percent increase in output during the next 20 years in order to meet market demands at the end of that period. Barring unforeseen emergencies, very little of this increase will be needed in the next few years. And even in the latter part of the 20-year period I see no reason for worry about "food enough" under peacetime conditions. The more important questions will be how to gear production expansion to market prospects, and how to produce the needed products efficiently, with returns to farmers comparable to other groups.

Shifts in production will be needed to meet market demands in the years ahead. The most rapid growing points in the market are in the livestock and fruits and vegetables sectors. On the other hand, the outlook is distinctly bearish for wheat for food uses. And unless new markets are developed, cotton also is likely to continue to encounter adjustment problems.

The question is then: What can researchers do to facilitate the needed shifts in production? What are the alternative uses of the wheat and cotton lands that need to be shifted? How can these adjustments be made in ways that will be profitable to farmers? The problems are big enough to challenge the best brains of researchers and of other people as well.

The problem of shifting is in part encompassed in the problem of building *reserve capacity*. These two problems together, seem to me, to offer the greatest challenge to researchers in applied fields who are looking for ways to make significant contributions to agricultural welfare.

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**COOPERATORS TO THE RESCUE.**—John Lyman, Middlefield, Conn., dairyman-orchardist, lost 50 registered Guernseys in a fire, but found the true meaning of the word, "cooperator." Twenty fellow-members of the Middlesex County Soil Conservation District rushed to help put out the blaze. Then, they stayed two more days cleaning up the ruins with their own trucks, tractors, and loaders. Lyman learned one other soil conservation advantage: His farm pond-water saved several nearby buildings from the flames.

ARTHUR H. MECKLEY

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**WOODLAND FARMING A SUCCESS.**—Mac Garland of Emmet, Ark., planted 4 acres to pine seedlings in 1940. In 1950 he made his first thinning and netted $21 [illegible] from the plantation.



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